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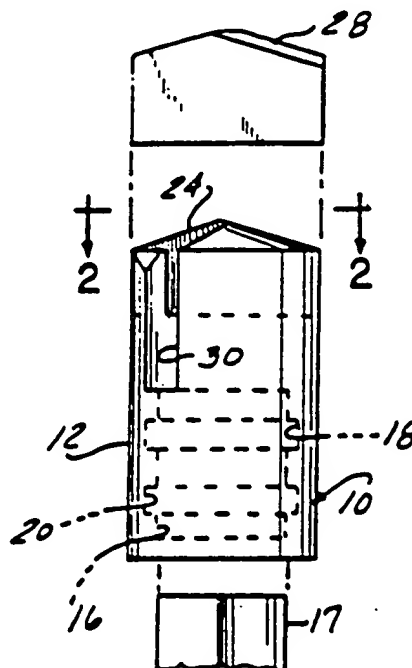
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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| (21) International Application Number: PCT/US84/01949 (22) International Filing Date: 29 November 1984 (29.11.84) (31) Priority Application Number: 556,005 (32) Priority Date: 29 November 1983 (29.11.83) (33) Priority Country: US (71) Applicant (for all designated States except US): GRAES-SLE, Clement, F. [US/US]; 28291 Kehrige Drive, Mt. Clemens, MI 48043 (US). (72) Inventor; and (75) Inventor/Applicant (for US only) : McKNIGHT, Herman [US/US]; 79555 Scotch Settlement, Romeo, MI 48065 (US). (74) Agents: SCHRAMM, William, J. et al.; Burton, Parker & Schramm, 301 Vicant Building, 59 North Walnut Street, Mount Clemens, MI 48043 (US). | | | (81) Designated States: AT (European patent), AU, BE (European patent), BR, CH (European patent), DE (European patent), FR (European patent), GB (European patent), JP, KP, LU (European patent), NL (European patent), SE (European patent), SU, US. Published With international search report. |

(54) Title: MINING DRILL BIT

(57) Abstract

A mining drill bit (10) which has a cylindrically shaped body (12) within which a shank end (14) includes a shank bore (16) that communicates with the shank head (24) via a diametrically disposed slot (30) that intersects at approximately 35° a second diametrically disposed head slot (26) which in turn carries a cutting element (28) such that dust and other debris created during the drilling operation will be carried through the open slot.



MINING DRILL BIT

CROSS-REFERENCE TO RELATED CASES

This application is a continuation-in-part of U.S. Serial No. 556,005 filed November 29, 1983, which is
5 hereby incorporated by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to improvements in the art of rock drilling and, in
10 particular, the present invention relates to an improved mining drill bit.

Description of the Prior Art

In drilling into rock, such as in mine drilling, it is conventional to use a hard carbide cutter
15 insert mounted upon a holder which, in turn, is fastened to the end of a hollow tubular shaft which is powered for rotation. The shaft is conventionally provided with openings near the holder so that the dust may be removed by applying a vacuum to the opposite end of the hollow
20 shaft. In drills of this type it is desirable to locate the dust collecting openings as close as possible to the cutter insert in order to promote efficient operation and to insure an efficient and rapid removal of the dust. Prior art mining drill bits are disclosed in United States
25 Letters Patents No. 3,163,246 and No. 3,434,553. The mining drill bits disclosed in these patents are provided with some type of opening at the end of the drill bit which is disposed in communication with the hollow interior of the drill bit shaft for debris removal. In
30 both of the aforementioned patents, bores are formed in the end of the drill bit on opposite sides of the cutter insert. In the prior art design the bores are of circular cross section and disposed at a predetermined angle with



respect to the longitudinal cutting axis of the drill. The prior art drill bits require a number of cutting operations in order to form the finished product and are relatively expensive to manufacture.

5 It is believed that the positioning of the openings near the head of the holder for the purpose of removing dust and other debris is critical to the operation of such mine drilling bits, and it has been Applicant's discovery that drilling bits of the prior art
10 having such openings tend to become clogged. This is due to their location with respect to the cutter insert and the size of such openings. Many of the prior art cutters have an opening which extends at right angles to the cutter insert and has a tendency to clog and prevent the
15 further withdraw of debris, resulting in high forces acting on the mining drill bit and a failure of the drill bit or the shaft driving the bit.

 It would therefore be desirable to have a mining drill bit which is of a simple design and which
20 obviates the disadvantages and objections attendant the prior art designs.

SUMMARY OF THE INVENTION

 The present invention, which will be described subsequently in greater detail, comprises a mining drill
25 bit that has a circular body with a longitudinal bore extending in from one end while the other end defines the head of the drill bit and includes a pair of intersecting slots arranged diametrically transversely of the longitudinal axis of the body. One of the slots receives
30 a cutting insert while the second slot, which is preferably disposed at an angle of about 20° to about 40° with respect to the first slot, provides a simple and efficient means of removing debris created as a result of the drilling operation.

35 It is therefore an object of the present



invention to provide a mining drill bit which obviates the disadvantages and objections of the prior art tools in that it is of a simple construction, inexpensive to manufacture and highly efficient in its use.

5. It is a further object of the present invention to provide a mining drill bit which has a uniquely designed opening for the rapid withdrawal of debris created by the drilling operation and one which tends to minimize the clogging of the opening leading to a longer and more useful life of the mining drill bit.

Other objects, advantages and applications of the present invention will become apparent to those skilled in the art of mining drill bits when the accompanying description of one example of the best mode contemplated for practicing the invention is read in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

The description herein makes reference to the accompanying drawing wherein like reference numerals refer to like elements throughout the several views, and wherein:

FIG. 1 is an exploded, front elevational view of a mining drill bit constructed in accordance with the principles of the present invention;

25 FIG. 2 is a top elevational view of the mining drill bit as seen from line 2-2 in FIG. 1;

FIG. 3 is a rear elevational view of the mining drill bit illustrated in FIG. 1 with the cutter insert removed for clarity; and

30 FIG. 4 is a bottom elevational view of the mining drill bit as seen from line 4-4 of FIG. 3 and rotated 90°.

FIGS. 5-8 are modifications of the drill bit of FIGS. 1-4 with corresponding views.



DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing and, in particular, to FIGS. 1 and 2, there is illustrated one example of the present invention in the form of a mining drill bit 10. The mining drill bit 10 is of a unitary construction having a cylindrically shaped body 12 which in the example illustrated has a diameter of 1.25 inches and a longitudinal length of 2.2 inches. The lower or shank portion 14 of the cylindrical body 12 has a hexagonally shaped bore 16 that extends approximately 1.25 inches into the interior of the body from the shank end 14 thereof. The bore 16 has a pair of longitudinally spaced undercuts 18 and 20 (FIG. 1), the purpose of which will be described hereinafter. The shank bore 16 is adapted to receive the tubular shaft 17 which rotatably drives the mining drill bit 10. The mining drill bit 10 is secured to the tubular shaft 17 by means of a set screw or a clip (not shown) that extends through radial bore 22 (see FIGS. 3 and 4) and engages the tubular shaft 17 in the conventional manner.

The head 24 of the mining drill bit 10 is slightly truncated and includes a first longitudinally transversely disposed slot 26 which is approximately .2 inches in width and extends the full diametrical width of the head 24. The slot 26 is approximately .56 inches in depth and is adapted to receive a cutting element or insert 28. The cutting element or insert 28 is conventional in its construction and is secured within the diametrical slot 26 in a suitable manner, such as by soldering, brazing or welding, so that the cutting element 28 has a conventional impact portion extending above the head 24 of the mining drill bit 10. In a conventional manner a copper or copper based alloy shim is utilized between insert 28 and slot 26.

mining drill bit 10 further provided with a flushing opening, the placement and formation of the opening being extremely important in prolonging the life of the bit 10 and the cutting insert 28 carried thereby. To form the flushing openings, a second diametrical slot 30 is formed in the head 24. As can best be seen in FIG. 2, the slot 30 is approximately .25 inch wide, 1.00 inch deep and extends the full diametrical width of the cutting head 24 intersecting and passing through the cutting element slot 26 at an angle "A" between 32° and 38°, and preferably 35°. In manufacturing the mining drill bit 10, the slots 26 and 30 are simply formed by first cutting one diametrical slot in one pass over the head 24 of the bit 10 and then forming the second slot at the desired width and depth. This very simple construction and method of manufacture results in a drill bit which is substantially less expensive to manufacture than the prior art devices and provides excellent results in operation. In operation debris and dust that is formed during the drilling operation will communicate with the tubular portion of the drive shaft 17 via the diametrical slot 30 and the interior of the bore of the shank bore 16. To facilitate manufacture, undercut or groove 18 is utilized to break metal chips of bit during broaching process. Bit 10 is held in place by retaining spring clip (not shown) fitting within groove 20.

In operation when the drill is operated in rock, a vacuum may be applied to the opposite end of the drive shaft 17 to suck in through the transverse slot 30 and the shank bore 16 the dust-laden air and the like, thereby cleaning the drill hole at the cutter insert which results in a longer life for the insert and the mining drill bit 10.

It is preferred that the angle of the first and second slots range from about 20° to about 40°, preferably about 30° to about 40°.



FIGS. 5-8 are modifications in the drill bit of FIGS. 1-4, with comparable views. It has been found that for ease of manufacturing the slots can be opened at the periphery 50, 50' of the drill bit as best shown in FIG. 5 6. This is best shown by comparing FIGS. 2 and 6.

In addition it may be desirable to brace the insert 28 where it is affixed to the body 12 of the bit.

Another alternative to joining the body 12 to drill shaft 17 would be to threadingly engage the shaft by 10 having female threads in the interior of the bit body 12.

Another modification of the invention would be to have a 5/16" (0.79 cm) opening for the slot 30 for a 1" (2.54 cm) carbide bit. For a 1-3/8" (3.49 cm) carbide bit the opening for slot 30 could be as wide as 3/8" (0.95 15 cm).

A further variation on the invention would be to have the insert 28 lengthened so that it will extend beyond the periphery of the body 12 to assist in the cutting operation.

20 It should be understood by those skilled in the art of mining drill bits that other forms of the present invention may be had, all coming within the spirit of the invention and scope of the appended claims.

Claims

1. A mining drill bit comprising a circular body having a longitudinal bore extending from one end of said body a predetermined distance along the longitudinal axis of said body, the other end of said body defining the head of said drill bit and having a first slot arranged diametrically transversely of the longitudinal axis of said body; said head having a second slot arranged diametrically transversely of the longitudinal axis of said body and extending inwardly into said head a sufficient distance to communicate with said longitudinal bore, said second slot intersecting said first slot at an angle substantially less than 90°.
2. The drill bit defined in claim 1 wherein said angle of intersection is between about 20° and about 40°.
3. The drill bit defined in claim 1 wherein said angle of intersection is 35°.
4. The drill bit defined in claim 1 wherein the width of said second slot is greater than the width of said first slot.
5. The drill bit defined in claim 1 wherein the depth of said second slot is greater than the depth of said first slot.
6. The drill bit defined in claim 1 wherein said first slot is adapted to receive and securely support a cutting insert.
7. The drill bit defined in claim 1 wherein said bore has a hexagonal shape.



8. The drill bit defined in claim 1 wherein said drill
bit bore is adapted to receive and be supported by a
shaft for rotatably driving said drill, said bore,
having a radial undercut, provides a passage for
debris to the shaft.
- 5
9. The drill bit defined in claim 8 further comprising
a plurality of said radial grooves disposed at
selected longitudinally displaced locations.
10. The drill bit defined in claim 1 wherein said angle
of intersection is between 33° and 38° .
- 10

INTERNATIONAL SEARCH REPORT

International Application No. PCT/US 84/01949

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC⁴: E 21 B 10/38; E 21 B 10/58

II. FIELDS SEARCHED

Minimum Documentation Searched ⁷

Classification System

Classification Symbols

IPC⁴

E 21 B

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched ⁸

III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹

| Category ¹⁰ | Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹² | Relevant to Claim No. ¹³ |
|------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| A | US, A, 2529788 (SIGNELL) 14 November 1950 see column 1, line 45 - column 2, line 27; column 3, lines 25-32 -- | 1,4-6 |
| A | DE, A, 3118844 (GOZELING) 11 March 1982 see page 8, line 19 - page 9, line 7 -- | 1,2 |
| A | US, A, 3269471 (ALEXANDER) 30 August 1966 see column 1, line 67 - column 2, line 47 -- | 1,8 |
| A | US, A, 3163246 (VAGINS) 29 December 1964 see column 3, lines 51-21 (cited in the application) -- | 1,6,8 |
| A | US, A, 4356873 (DZIAK) 2 November 1982 see column 3, lines 37-63 -- | 1,6 |
| A | DE, C, 803895 (JESCHKE) 15 February 1951 see page 2, lines 51-81 ----- | 1,6 |

* Special categories of cited documents: ¹⁰

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understate the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"A" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search

14th February 1985

Date of Mailing of this International Search Report

13 MARS 1985

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

G.L.M. Kroghenberg

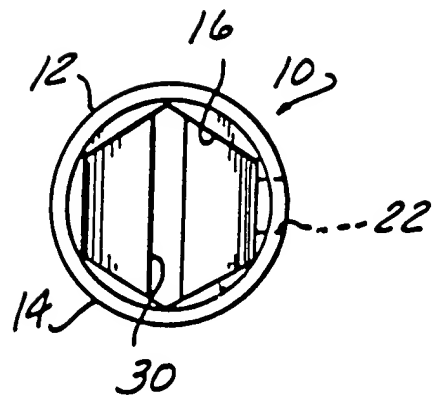
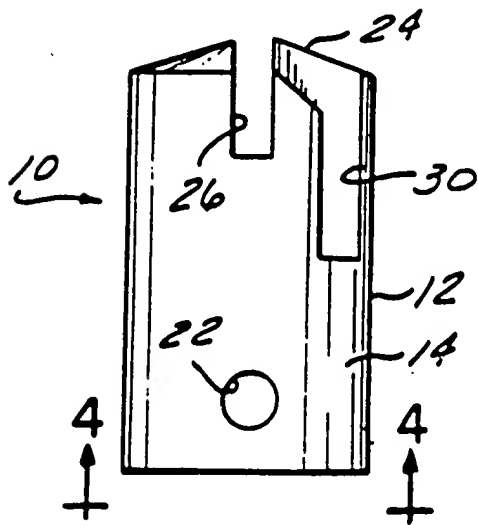
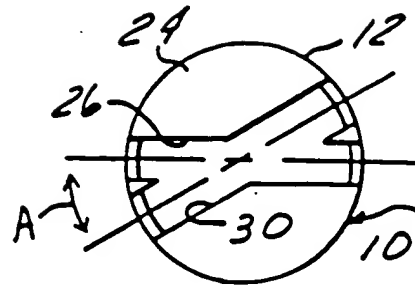
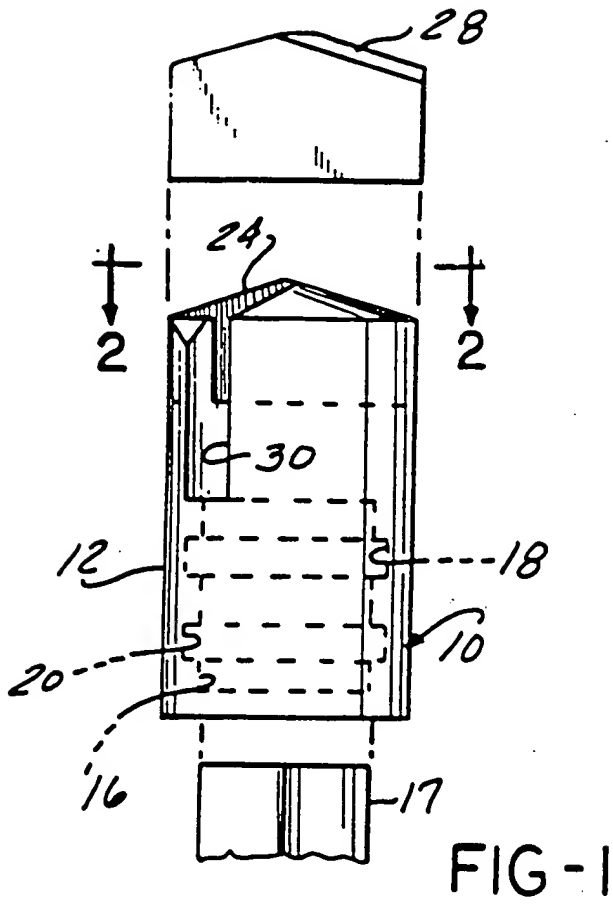


FIG.5

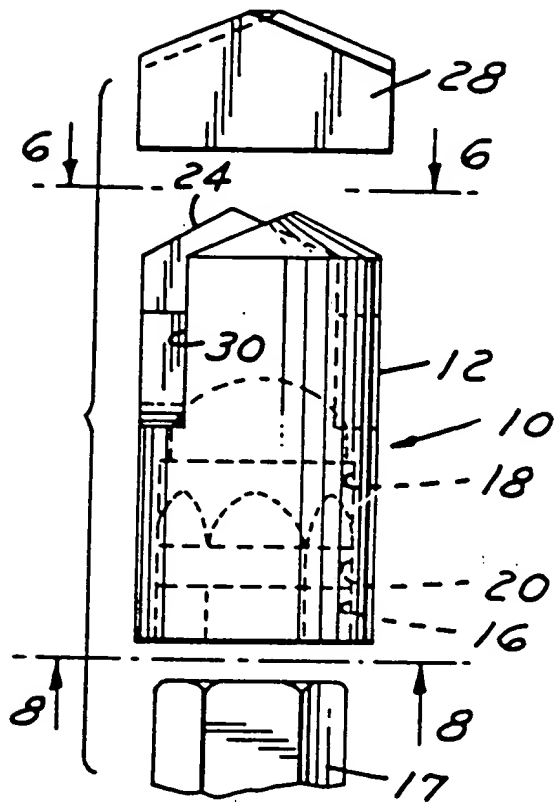


FIG.6

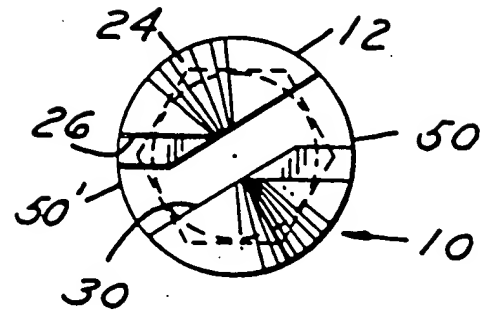


FIG.7

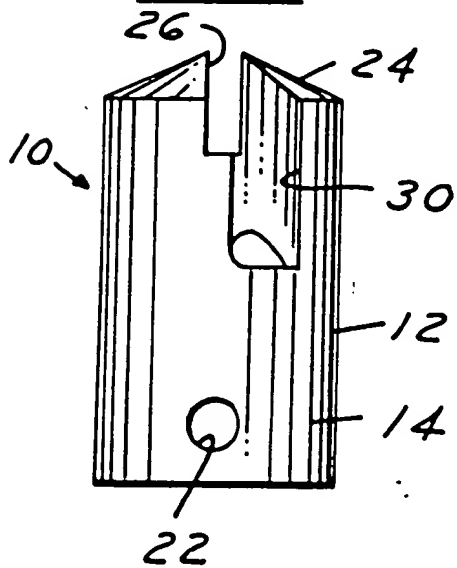


FIG.8

